



## ELPT 1370 - Advanced Electricity .1H1 Course Syllabus

### Description

Introduction to advanced electrical theory and circuitry including, power factor, induction, capacitance, apparent power, sine wave analysis, and complex circuitry. Power distribution calculations and circuits are also included.

**Credits** 3

**Lecture Hours** 2

**Lab Hours** 3

**Extended Hours** 0

**Contact Hours** 80

**State Approval Code** 46.0301

**Instructor Name** Steven Lucas

**Semester/Year** Spring 2025

### Meeting Time and Location

Tuesdays 3:25pm - 5:30pm

MEB 1134

### Alternate Operations During Campus Closure

In the event of an emergency or announced campus closure due to a natural disaster or pandemic, it may be necessary for Panola College to move to altered operations. During this time, Panola College may opt to continue delivery of instruction through methods that include, but are not limited to: online learning management system (CANVAS), online conferencing, email messaging, and/or an alternate schedule. It is the responsibility of the student to monitor Panola College's website ([www.panola.edu](http://www.panola.edu)) for instructions about continuing courses remotely, CANVAS for each class for course-specific communication, and Panola College email for important general information.

### Student Basic Needs

Unexpected circumstances may arise, but Panola College offers various resources to support students. If you need mental health services or are facing challenges with transportation, affording class materials and supplies, or accessing food regularly—issues that may impact your class performance—please visit [panola.edu/resources](http://panola.edu/resources).

### Class Attendance

Regular and punctual attendance of classes and laboratories is required of all students. When a student has been ill or absent from class for approved extracurricular activities, he or she should be allowed, as far as possible, to make up for the missed work. If a student has not actively participated by the census date, they will be dropped by the instructor for non-attendance. This policy applies to courses that are in-person, online, hybrid, and hyflex.

Attendance in online courses is determined by submission of an assignment or participation in an activity. According to federal guidelines, simply logging into a distance learning course without participating in an academic assignment does not constitute attendance. Distance learning is defined as when a majority (more than 50%) of instruction occurs when the instructor and students are in separate physical locations. Students must engage in an academic activity prior to the course census date.

When an instructor feels that a student has been absent to such a degree as to invalidate the learning experience, the instructor may recommend to the Vice President of Instruction that the student be withdrawn from the course. Instructors may seek to withdraw students for non-attendance after they have accumulated the following number of absences:

Fall or spring semesters:

3 or more class meeting times per week - 5 absences

2 class meeting times per week - 3 absences

1 class meeting per week - 2 absences

The student is responsible for seeing that he or she has been officially withdrawn from a class. A student who stops attendance in a class without officially withdrawing from that class will be given a failing grade; consequently, the student must follow official withdrawal procedures in the Admissions/Records Office.

Please note: Health Science and Cosmetology courses may require more stringent attendance policies based on their accreditation agencies. Please see the addendum and/or program handbook for further information concerning attendance.

### **Pregnant/Parenting Policy**

Panola College welcomes pregnant and parenting students as a part of the student body. This institution is committed to providing support and adaptations for a successful educational experience for pregnant and parenting students. Students experiencing a need for accommodations related to pregnancy or parenting will find a Pregnancy and Parenting Accommodations Request form in the Student Handbook or may request the form from the course instructor.

### **Artificial Intelligence (AI) Course Policy**

**No use of Generative AI permitted.**

This option assumes that all work submitted by students will be generated by the students themselves, whether they are working individually or in groups. Students should not have another person or entity do the writing of any portion of an assignment, which includes hiring a person or a company to write assignments and/or using artificial intelligence (AI) tools like ChatGPT. Use of any AI-generated content in this course qualifies as academic dishonesty and violates Panola College's standards of academic integrity.

### **Instructional Goals and Purposes**

The purpose of this course is to explain alternating current waveform power generation; explain how properties other than resistance can limit the flow of current; determine the values of AC voltage, current, and impedance for circuits containing resistors, capacitors, and inductors; explain and calculate power factor in circuits; and utilize electrical measuring instruments.

### **Learning Outcomes**

1. Basics of Alternating Current (AC)
2. Inductance in AC circuits
3. Resistive - Inductive Series Circuits
4. Resistive - Inductive Parallel Circuits
5. AC Circuits Containing Capacitors
6. Capacitance in AC Circuits
7. Resistive - Capacitive Series Circuits
8. Resistive - Capacitive Parallel Circuits
9. Resistive - Inductive - Capacitive Series Circuits
10. Resistive - Inductive - Capacitive Parallel Circuits

### **Specific Course Objectives (includes SCANS)**

After studying all materials and resources presented in the course, the student will be able to:

1. **Alternating Current.** SCANS (1 A-I, 1A-ii, 1A-iv, 1B-iii, 1B-iv, 1C-I, 1C-iv, 2A-I, 2A-iii, 2B-I, 2C-i, 2C- ii, 2C-iii, 2D-ii, 2D-iii, 2E-ii)
  - a. Discuss the differences between DC and AC.

- b. Compute instantaneous values of voltage and current for a sine wave.
  - c. Compute peak, RMS, and average value of voltage and current.
  - d. Discuss the phase relationship of voltage and current in a pure resistive circuit.
2. **Inductance in AC Circuits.** SCANS (1 A-I, 1A-ii, 1A-iv, 1B-iii, 1B-iv, 1C-I, 1C-iv, 2A-I, 2A-iii, 2B-I, 2C-i, 2C-ii, 2C-iii, 2D-ii, 2D-iii, 2E-ii)
    - a. Discuss the properties of inductance in an AC circuit.
    - b. Discuss inductive reactance.
    - c. Calculate values of inductive reactance and inductance.
    - d. Discuss the relationship of voltage and current in a pure inductive circuit.
    - e. Calculate values for inductors connected in series or parallel.
    - f. Discuss reactive power (VARs).
    - g. Determine the Q of a coil.
  3. **Resistive- Inductive Series Circuits.** SCANS (1 A-I, 1A-ii, 1A-iv, 1B-iii, 1B-iv, 1C-I, 1C-iv, 2A-I, 2A-iii, 2B-I, 2C-i, 2C- ii, 2C-iii, 2D-ii, 2D-iii, 2E-ii)
    - a. Discuss the relationship of resistance and inductance in an AC circuit.
    - b. Define power factor.
    - c. Calculate values of voltage, current, apparent power, true power, reactive power, impedance, resistance, inductive reactance, and power factor in an R- L series circuit.
    - d. Calculate the phase angle for current and voltage in an R- L series circuit.
    - e. Connect an R-L series circuit and make measurements using test instruments.
    - f. Discuss vectors and be able to plot electrical quantities using vectors.
  4. **Resistive - Inductive Parallel Circuits.** SCANS (1 A-I, 1A-ii, 1A-iv, 1B-iii, 1B-iv, 1C-I, 1C-iv, 2A-I, 2A-iii, 2B-I, 2C-i, 2C- ii, 2C-iii, 2D-ii, 2D-iii, 2E-ii)
    - a. Discuss the operation of a parallel circuit containing resistance and inductance.
    - b. Calculate circuit values of an R-L parallel circuit.
    - c. Connect an R-L parallel circuit and measure circuit values with test instruments.
  5. **Capacitors.** SCANS (1 A-I, 1A-ii, 1A-iv, 1B-iii, 1B-iv, 1C-I, 1C-iv, 2A-I, 2A-iii, 2B-I, 2C-i, 2C- ii, 2C-iii, 2D-ii, 2D-iii, 2E-ii)
    - a. List the three factors that determine the capacitance of a capacitor.
    - b. Discuss the electrostatic charge.
    - c. Discuss the differences between non-polarized and polarized capacitors.
    - d. Calculate values for series and parallel connections of capacitors.
    - e. Calculate an RC time constant.
  6. **Capacitance in AC Circuits.** SCANS (1 A-I, 1A-ii, 1A-iv, 1B-iii, 1B-iv, 1C-I, 1C-iv, 2A-I, 2A-iii, 2B-I, 2C-i, 2C- ii, 2C-iii, 2D-ii, 2D-iii, 2E-ii)
    - a. Explain why current appears to flow through a capacitor when it is connected to an AC circuit.
    - b. Discuss capacitive reactance.
    - c. Calculate the value of capacitance in an AC circuit.
    - d. Discuss the relationship between voltage and current in a pure capacitive circuit.
  7. **Resistive - Capacitive Series Circuits.** SCANS (1 A-I, 1A-ii, 1A-iv, 1B-iii, 1B-iv, 1C-I, 1C-iv, 2A-I, 2A-iii, 2B-I, 2C-i, 2C- ii, 2C-iii, 2D-ii, 2D-iii, 2E-ii)
    - a. Discuss the relationship between resistance and capacitance in an AC series circuit.
    - b. Calculate values of voltage, current, apparent power, true power, reactive power, impedance, resistance, inductive reactance, and power factor in an RC series circuit.
    - c. Calculate the phase angle for current and voltage in an RC series circuit.
    - d. Connect an RC series circuit and make measurements using test instruments.
  8. **Resistive - Capacitive Parallel Circuits.** SCANS (1 A-I, 1A-ii, 1A-iv, 1B-iii, 1B-iv, 1C-I, 1C-iv, 2A-I, 2A-iii, 2B-I, 2C-i, 2C- ii, 2C-iii, 2D-ii, 2D-iii, 2E-ii)
    - a. Discuss the operation of a parallel circuit containing resistance and capacitance.
    - b. Calculate circuit values of an RC parallel circuit.
    - c. Connect an RC parallel circuit and measure circuit values with test instruments.
  9. **Resistive - Inductive - Capacitive Series Circuits.** SCANS (1 A-I, 1A-ii, 1A-iv, 1B-iii, 1B-iv, 1C-I, 1C-iv, 2A-I, 2A-iii, 2B-I, 2C-i, 2C- ii, 2C-iii, 2D-ii, 2D-iii, 2E-ii)
    - a. Discuss AC circuits that contain resistance, inductance, and capacitance connected in series.
    - b. Connect an RLC series circuit.
    - c. Calculate values of impedance, inductance, capacitance, power, VARs, reactive power, voltage drop across individual components, power factor, and phase angle of voltage and current.

- d. Discuss series resonant circuits.
10. **Resistive – Inductive - Capacitive Parallel Circuits.** SCANS (1 A-I, 1A-ii, 1A-iv, 1B-iii, 1B-iv, 1C-I, 1C-iv, 2A-I, 2A-iii, 2B-I, 2C-i, 2C- ii, 2C-iii, 2D-ii, 2D-iii, 2E-ii)
- Discuss parallel circuits that contain resistance, inductance, and capacitance.
  - Calculate the values of an RLC parallel circuit.
  - Calculate values of impedance, inductance, capacitance, power, reactive power, current flow through individual components, power factor, and phase angle from measurements taken.
  - Discuss the operation of a parallel resonant circuit.
  - Calculate the power factor correction for an AC motor.

### **Course Content**

A general description of lecture/discussion topics included in this course are listed in the Learning Objectives / Specific Course Objectives sections of this syllabus.

Students in all sections of this course will be required to do the following:

- Students will study assigned materials and complete quizzes and exams to assess understanding and comprehension.
- Students will complete all lab assignments as scheduled and all students are required to wear Personal Protective Equipment (PPE) in the lab.

### **Methods of Instruction/Course Format/Delivery**

Students in traditional, hybrid and Internet classes will have access to courses via Canvas. Students in the traditional class will meet regularly for lectures. Students in the Internet class will be required to take quizzes and exams at an approved testing facility or, they may also be administered by the instructor. Students in hybrid classes will have both in-class and online assignments. Hybrid classes are required to read the assigned material, take quizzes and exams as assigned by the instructor, and complete assigned homework prior to meeting for the face to face labs. Resources for this course, provided through Canvas, include the following Sections in Canvas...

- Modules: Chapter study materials, self-assessment exercises, quizzes and exams
- Announcements and Recent Activities List: Instructor Announcements
- Inbox: Email (to communicate with instructor and classmates inside Canvas)
- Grades: Student grades
- Other sections, as assigned by the Instructor: Students in both the traditional and Internet classes should use the People feature within Canvas (includes Canvas Email) to communicate with the instructor. Using Canvas Email located in the "Inbox" menu gives the student access to the instructor and other classmates without having to remember or type email addresses; the student just selects a name from the list. The instructor will attempt to respond to all Canvas email within 24 hours. For example, if a student makes an appointment with the instructor through Canvas email to take an exam, the instructor will reply to the student's Canvas email – if the instructor does not reply within the time needed, call the instructor's at his or her office. Please, always include in the subject line of the Canvas email, the student's name, course number, and course section number.

### **Major Assignments/Assessments**

The following items are assigned and assessed during the semester and used to calculate the student's final grade.

### **Course Grade**

The grading scale for this course is as follows:

Category Percentage:

Exams = 40%

Quizzes = 30%

Lab Exercises = 20%

Attendance = 10%

## Other

- Courses conducted via video conferencing may be recorded and shared for instructional purposes by the instructor.
- For current texts and materials, use the following link to access bookstore listings: <https://www.panolacollegestore.com>.
- For testing services, use the following link: <https://www.panola.edu/student-services/studentsupport/academic-testing-center>.
- If any student in this class has special classroom or testing needs because of a physical learning or emotional condition, please contact the ADA Student Coordinator in Support Services located in the Charles C. Matthews Student Center or go to <https://www.panola.edu/studentservices/student-support/disability-support-services> for more information.
- Withdrawing from a course is the student's responsibility. Students who do not attend class and who do not withdraw will receive the grade earned for the course.
- Student Handbook: <https://www.panola.edu/> (located on at the bottom under student)

## SCANS Criteria

1. Foundation skills are defined in three areas: basic skills, thinking skills, and personal qualities.
  - a. Basic Skills: A worker must read, write, perform arithmetic and mathematical operations, listen, and speak effectively. These skills include:
    - i. Reading: locate, understand, and interpret written information in prose and in documents such as manuals, graphs, and schedules.
    - ii. Writing: communicate thoughts, ideas, information, and messages in writing, and create documents such as letters, directions, manuals, reports, graphs, and flow charts.
    - iii. Arithmetic and Mathematical Operations: perform basic computations and approach practical problems by choosing appropriately from a variety of mathematical techniques.
    - iv. Listening: receive, attend to, interpret, and respond to verbal messages and other cues.
    - v. Speaking: Organize ideas and communicate orally.
  - b. Thinking Skills: A worker must think creatively, make decisions, solve problems, visualize, know how to learn, and reason effectively. These skills include:
    - i. Creative Thinking: generate new ideas.
    - ii. Decision Making: specify goals and constraints, generate alternatives, consider risks, and evaluate and choose the best alternative.
    - iii. Problem Solving: recognize problems and devise and implement plan of action.
    - iv. Visualize ("Seeing Things in the Mind's Eye"): organize and process symbols, pictures, graphs, objects, and other information.
    - v. Knowing How to Learn: use efficient learning techniques to acquire and apply new knowledge and skills.
    - vi. Reasoning: discover a rule or principle underlying the relationship between two or more objects and apply it when solving a problem.
  - c. Personal Qualities: A worker must display responsibility, self-esteem, sociability, self management, integrity, and honesty.
    - i. Responsibility: exert a high level of effort and persevere toward goal attainment.
    - ii. Self-Esteem: believe in one's own self-worth and maintain a positive view of oneself.
    - iii. Sociability: demonstrate understanding, friendliness, adaptability, empathy, and politeness in group settings.
    - iv. Self-Management: assess oneself accurately, set personal goals, monitor progress, and exhibit self-control.
    - v. Integrity and Honesty: choose ethical courses of action.
2. Workplace competencies are defined in five areas: resources, interpersonal skills, information, systems, and technology.
  - a. Resources: A worker must identify, organize, plan, and allocate resources effectively.
    - i. Time: select goal-relevant activities, rank them, allocate time, and prepare and follow schedules.
    - ii. Money: Use or prepare budgets, make forecasts, keep records, and make adjustments to meet objectives.

- iii. **Material and Facilities:** Acquire, store, allocate, and use materials or space efficiently. Examples: construct a decision timeline chart; use computer software to plan a project; prepare a budget; conduct a cost/benefits analysis; design an RFP process; write a job description; develop a staffing plan.
  - b. **Interpersonal Skills:** A worker must work with others effectively.
    - i. **Participate as a Member of a Team:** contribute to group effort.
    - ii. **Teach Others New Skills.**
    - iii. **Serve Clients/Customers:** work to satisfy customer's expectations.
    - iv. **Exercise Leadership:** communicate ideas to justify position, persuade and convince others, responsibly challenge existing procedures and policies.
    - v. **Negotiate:** work toward agreements involving exchange of resources, resolve divergent interests.
    - vi. **Work with Diversity:** work well with men and women from diverse backgrounds. Examples: collaborate with a group member to solve a problem; work through a group conflict situation, train a colleague; deal with a dissatisfied customer in person; select and use appropriate leadership styles; use effective delegation techniques; conduct an individual or team negotiation; demonstrate an understanding of how people from different cultural backgrounds might behave in various situations.
  - c. **Information:** A worker must be able to acquire and use information.
    - i. **Acquire and Evaluate Information.**
    - ii. **Organize and Maintain Information.**
    - iii. **Interpret and Communicate Information.**
    - iv. **Use Computers to Process Information.** Examples: research and collect data from various sources; develop a form to collect data; develop an inventory record-keeping system; produce a report using graphics; make an oral presentation using various media; use on-line computer databases to research a report; use a computer spreadsheet to develop a budget.
  - d. **Systems:** A worker must understand complex interrelationships.
    - i. **Understand Systems:** know how social, organizational, and technological systems work and operate effectively with them.
    - ii. **Monitor and Correct Performance:** distinguish trends, predict impacts on system operations, diagnose deviations in systems' performance and correct malfunctions.
    - iii. **Improve or Design Systems:** suggest modifications to existing systems and develop new or alternative systems to improve performance. Examples: draw and interpret an organizational chart; develop a monitoring process; choose a situation needing improvement, break it down, examine it, propose an improvement, and implement it.
  - e. **Technology:** A worker must be able to work with a variety of technologies.
    - i. **Select Technology:** choose procedures, tools or equipment including computers and related technologies.
    - ii. **Apply Technologies to Task:** understand overall intent and proper procedures for setup and operation of equipment.
    - iii. **Maintain and Troubleshoot Equipment:** Prevent, identify, or solve problems with equipment, including computers and other technologies. Examples: read equipment descriptions and technical specifications to select equipment to meet needs; set up and assemble appropriate equipment from instructions; read and follow directions for troubleshooting and repairing equipment.